Foxboro Evo™ Process Automation System

Product Specifications

Foxboro®

by Schneider Electric

PSS 31H-2Z46

FBM246/b, FoxCom™ Redundant Dual Baud Rate, Intelligent Device Modules

The FBM246 consists of a pair of Fieldbus Modules that contain eight individual channels, each providing digital communication capabilities to a Foxboro Intelligent Field Device. The FBM246b consists of a pair of Fieldbus Modules that each contain four dual baud, FoxCom™ communication channels and four 0-20 mA analog output channels.

OVERVIEW

The FBM246, FoxCom™ Redundant Dual Baud Rate, Intelligent Device Module to Intelligent Field Devices consists of a pair of Fieldbus Modules that contain eight individual FoxCom channels.

The FBM246b, FoxCom™ Redundant Dual Baud Rate, Intelligent Device Module to Intelligent Field Devices consists of a pair of Fieldbus Modules that contain four dual baud, FoxCom communication channels and four 0-20 mA analog output channels.

Each input provides internal isolated power and digital communication capabilities to a Foxboro™ Intelligent Field Device. Each channel communicates over a single twisted pair of wires and each channel of the FBM246/246b is channel isolated. The modules also allow the use of an external power supply to power the Intelligent Field Device. (The use of an external power supply common to two or more loops requires the use of a Cable Balun Module to maintain digital communication line balance).

A redundant pair of the modules combine to provide redundancy at the Fieldbus Module (FBM) level, with field I/O wired to one common termination assembly (see Figure 1).

The baud rate is determined by the configuration of the field device connected to each channel, independently of the other channels. The modules provide bidirectional digital communication at 4800 baud rate between the Intelligent Field Device and the system redundant Fieldbus, or provides bidirectional digital communication at 600 baud rate between the field device and the module while allowing a simultaneous 4 to 20 mA analog signal to an emergency shutdown system.

The modules are Intelligent Field Device hosts, enabling the system to receive digital messages from the field device in engineering units. Each message is received ten times per second at 4800 baud, and two times per second at 600 baud, and contains:

- Up to three measured variables in IEEE 32-bit floating-point format
- Security information
- Diagnostics
- Message checking.

This information is available to all elements of the system.

Since the communication is bidirectional, the system can display the output, transmitter temperature (°C and °F), and the results of continuous self-diagnostics. In addition, the following information can be displayed or reconfigured from the console, a Field Communicator, or PC-Based Configurator:

- Output in engineering units
- Fail-safe information
- Tag number, name and location
- Device name (letterbug)
- Last calibration date
- Two levels of upload/download capabilities.

When connected to the appropriate TAs, the FBM246b module provides functionality formerly provided by the 100 Series FBM I/O subsystem. TAs are available which support the functionality of the 100 Series FBM46.

FEATURES

Key features of the FBM246/246b are:

- For the FBM246, eight individual digital communication channels
- For the FBM246b, four dual baud, FoxCom™ communication channels and four 0-20 mA analog output channels
- Receives messages ten times per second at 4800 baud, and two times per second at 600 baud, and contains:
  - Up to three measured variables in IEEE 32-bit floating-point format
  - Security information
  - Diagnostics
  - Message checking.
- Redundant modules increase reliability
- Allows use of an external power supply or the FBM246/246b internal isolated power to power the Intelligent Field Device
- Digital communication capabilities to a Foxboro Intelligent Field Device over a single twisted pair of wires
- Allows a simultaneous 4 to 20 mA analog signal from the field device to an emergency shutdown system
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM246/246b
- TAs for non-intrinsically safe or intrinsically safe applications.

HIGH RELIABILITY

The redundancy of the module pair, coupled with the high coverage of faults, provides a very high subsystem availability time.

The microprocessor of each module executes the I/O application program, plus diagnostic routines that validate the health of the FBM.

Either module may be replaced without upsetting field input or output signals to the good module. The module can be removed/replaced without removing field device termination cabling, power, or communications cabling.

NOTE

For safety reasons, always consider the possible impact on plant operations before removing the module.

COMPACT DESIGN

FBM246/246b has a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. Enclosures specially designed for mounting of the FBMs provide various levels of environmental protection, up to harsh environments per ISA Standard S71.04.

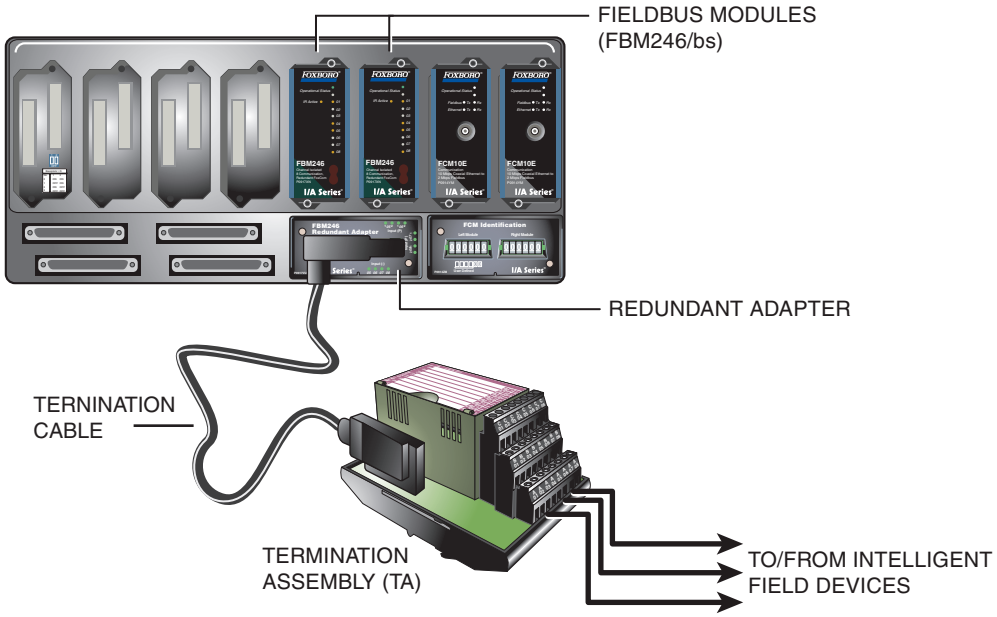


Figure 1. Redundant I/O Configuration

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the modules provide visual indication of the module operational status, and communication activity of the input channels.

FIELDBUS COMMUNICATION

The Fieldbus Communications Module (FCM) or the Field Control Processor (FCP) interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM246/246b accepts communication from either path (A or B) of the 2 Mbps Fieldbus — should one path fail or be switched at the system level, the module continues communication over the active path.

MODULAR BASEPLATE MOUNTING

The FBM246/246b modules mount on a DIN rail mounted Modular Baseplate, which accommodates up to four or eight Fieldbus Modules. The Modular Baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant Module Fieldbus, redundant independent dc power, and termination cables.

Redundant modules must be located in adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide a single termination cable connection (see Figure 1). A single termination cable connects from the redundant adapter to the associated termination assembly (TA).

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies (TAs).

For the FBM246, Termination Assemblies (P0916BA and P0931KJ) contain a 51 ohm resistor in series with each channel for use in non- intrinsically safe applications.

Termination Assembly (P0917XW) is a direct channel for use in intrinsically safe applications. An intrinsic safety barrier must be connected to each channel of this TA providing the necessary resistance for each channel.

TAs P0916BA and P0917XW are available in Polypropylene (PVC) material, while TA P0931KJ is available in Polyamide material.

For the FBM246b, TAs P0924QQ and P0924QY are available for use in non-intrinsically safe applications. TA P0924QY has output bypass jacks which assist in removing FBMs from service while continuing to provide manually driven milliamp output signals from an Output Bypass Station through the bypass jacks to prevent interruption of the process output signals, used during system maintenance.

A redundant adapter connects the redundant FBMs baseplate input/output connectors together. The redundant adapter provides a single termination connection to a single TA (see Figure 1).

The DIN rail mounted TAs connect to the redundant adapter by means of a removable termination cable. The cable is available in a variety of lengths, up to 30 meters (98 feet), allowing the TA to be mounted in either the enclosure or in an adjacent enclosure. Termination cables are available in the following materials:

- Polyurethane
- Low Smoke Zero Halogen (LSZH).

Refer to Table 1 on page 9.

CABLE BALUN MODULE

A Cable Balun Module maintains digital communication line balance for Intelligent Field Devices connected in FBM loops that are powered from a common external power supply. This powering method effectively connects one line of each loop to a single point. (Without the baluns, the multiple common connections at the external power source cause communication cross-talk between the loops.) Baluns are not required for loops that use internal power sourcing (powered from the FBM).

The Cable Balun Module (Invensys Part Number P0903SV) contains four baluns, with one balun used for each loop powered from the external power supply. Each balun adds 28 ohms of resistance to its associated loop.

Cable Balun Module		
Module Model	**Module Part No.**	**No. of Baluns in the Module**
CBM-4	P0903SV	4

FUNCTIONAL SPECIFICATIONS

Field Device Channel

INTERFACE

FBM246
Eight isolated and independent channels

FBM246b
Four channel isolated, dual baud, FoxCom communication channels and four 0 -20 mA analog output channels

COMMUNICATIONS
Non-redundant, point-to-point, master/slave, asynchronous, half-duplex communication, at a software selectable baud rate of 600 or 4800 baud. Each channel baud rate may be independently set.

ERROR CHECKING
CCITT 2-byte CRC

SPEED
10 messages per second at 4800 baud, or 2 messages per second at 600 baud.

MAXIMUM DISTANCE (INTERFACE TO FIELD DEVICE)
[Shielded twisted pair, or at minimum, twisted pair with overall shield using 0.50 mm^2 (22 AWG) wire]
600 m (2000 ft) (shielded twisted pair) at 4800 baud, or 1800 m (6000 ft) at 600 baud
The maximum allowable distance decreases when the loop is operated through an Intrinsic Safety barrier. See MI 020-350.

COMPLIANCE VOLTAGE
19 V dc minimum at 20.5 mA
Includes voltage drop across 51 Ω resistor in Termination Assembly and 136 Ω resistor and diodes in Redundant Adapter.

MAXIMUM LOOP RESISTANCE
Up to 400 Ω with Intrinsic Safety Barrier installed.
Up to 330 Ω with Intrinsic Safety Barrier not installed.

FBM INPUT IMPEDANCE
200 Ω nominal

ISOLATION
Each channel is galvanically isolated and referenced to ground, and the card itself is referenced to ground. The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and earth (ground) and any channel.

CAUTION

This does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

FIELD DEVICE INTERNAL POWER
23.1 to 25.3 V dc, source resistance 200 Ω (includes 51 Ω resistor in Termination Assembly and 136 Ω in Redundant Adapter)

FBM246b Output Channels (Four) - Specifications

ANALOG ACCURACY
±0.05% of span

OUTPUT LOAD
750 Ω maximum

OUTPUT PROCESSING DELAY
30 ms maximum

RESOLUTION
13 bits

FIELD DEVICE CABLING DISTANCE
Maximum distance of the field device from the FBM is a function of compliance voltage (19.6 V dc at 20.4 mA), wire resistance, and voltage drop at the field device.

LOOP POWER SUPPLY PROTECTION
Each channel is channel-to-channel galvanically isolated, current limited, and voltage regulated. All analog outputs are limited by their design to about 25 mA. If the output FET shorts, the output current could increase up to 35 mA. In normal operation the FBM outputs a constant current into a 0 to 750 ohm load.

Fieldbus Communication

Communicates with its associated FCM or FCP via the redundant 2 Mbps module Fieldbus

FUNCTIONAL SPECIFICATIONS (CONTINUED)

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)
24 V dc +5%, -10%

CONSUMPTION
10 W (maximum) per pair

HEAT DISSIPATION
6 W (maximum) per pair

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 89/336/EEC
Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 Annex A (Industrial Levels)

CISPR 11, Industrial Scientific and Medical (ISM) Radio-frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement
Meets: Class A Limits

IEC 61000-4-2 ESD Immunity
Contact 4 kV, air 8 kV

IEC 61000-4-3 Radiated Field Immunity
10 V/m at 80 to 1000 MHz

IEC 61000-4-4 Electrical Fast Transient/Burst Immunity
2 kV on I/O, dc power and communication lines

IEC 61000-4-5 Surge Immunity
2kV on ac and dc power lines; 1kV on I/O and communications lines

IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio-frequency Fields
10 V (rms) at 150 kHz to 80 MHz on I/O, dc power and communication lines

IEC 61000-4-8 Power Frequency Magnetic Field Immunity
30 A/m at 50 and 60 Hz

PRODUCT SAFETY

Underwriters Laboratories (UL) for U.S. and Canada
UL/UL-C listed as suitable for use in UL/UL-C listed Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems. These modules are also UL and UL-C listed as associated apparatus for supplying non-incendive communication circuits for Class I, Groups A-D hazardous locations when connected to specified Foxboro Evo™ processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

European Low Voltage Directive 73/23/EEC and Explosive Atmospheres (ATEX) Directive 94/9/EC
CENELEC (DEMKO) certified as EEx nA IIC T4 for use in CENELEC certified Zone 2 enclosure certified as associated apparatus for supplying non-incendive field circuits for Zone 2, Group IIC, potentially explosive atmospheres when connected to specified Foxboro Evo processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

Calibration Requirements

Calibration of the module and termination assembly is not required.

ENVIRONMENTAL SPECIFICATIONS(1)

Operating

TEMPERATURE

FBM246/246b
-20 to +70°C (-4 to +158°F)
Termination Assembly
-20 to +50°C (-4 to +122°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +3,000 m (-1,000 to +10,000 ft)

Storage

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +12,000 m (-1,000 to +40,000 ft)

Contamination

Suitable for use in Class G3 (Harsh) environments as defined in ISA Standard S71.04, based on exposure testing according to EIA Standard 364-65, Class III.

Vibration

7.5 m/S^2 (0.75 g) from 5 to 500 Hz

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The FBM246/246b mounts on a Modular Baseplate. The Modular Baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. Redundant modules must be located in odd and adjacent even positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). Alternatively, FBM246b mounts on a 100 Series conversion mounting structure. Refer to *Standard 200 Series Baseplates* (PSS 31H-2SBASEPLT) or *100 Series Conversion Mounting Structures* (PSS 31H-2W8) for details.

TERMINATION ASSEMBLY

The TA accommodates multiple DIN styles including 32 mm (1.26) and 35 mm (1.38 in) rails.

Weight

MODULE

284 g (10 oz) approximate (each module)

TA - COMPRESSION SCREW

363 g (0.8 lb) approximate

Dimensions

MODULE

Height
102 mm (4 in)
114 mm (4.5 in) including mounting lugs
Width
45 mm (1.75 in)
Depth
104 mm (4.11 in)

TERMINATION ASSEMBLIES

See page 10

Part Numbers

FBM246 MODULE

P0917XN

FBM246 TA - COMPRESSION SCREW

P0916BA and P0931KJ for use with non-intrinsic safety applications
P0917XW for use with intrinsic safety applications

(1) The environmental limits of this module may be enhanced by the type of enclosure containing the module. [Refer to the applicable Product Specification Sheet (PSS) which describes the specific type of enclosure that is to be used.]

PHYSICAL SPECIFICATIONS (CONTINUED)

Part Numbers (Cont.)

FBM246b MODULE
P0927AE

FBM246b TA - COMPRESSION SCREW
P0924QQ and P0924QY (with output bypass jacks) for non-intrinsic safety applications

REDUNDANT ADAPTER

FBM246
P0917VU
FBM246b
P0924DZ

Indicators (mounted on front of each module)

OPERATIONAL STATUS
Red and green light-emitting diodes (LEDs)

CHANNEL COMMUNICATION ACTIVITY
8 amber LEDs, one per channel

Termination Cables

CABLE LENGTHS
Up to 30 m (98 ft).

CABLE MATERIALS
Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE
Type 1 - Refer to Table 1 on page 9

CABLE CONNECTION

FBM Baseplate End
37-pin D-subminiature
Termination Assembly End
25-pin D-subminiature

Termination Assembly Construction Material

MATERIAL

P0916BA and P0917XW
Polypropylene (PVC) Material, compression
P0931KJ, P0924QQ and P0924QY
Polyamide Material, compression

Field Termination Connections

COMPRESSION-TYPE ACCEPTED WIRING SIZES

Solid/Stranded/AWG
0.2 to 4 mm^2/0.2 to 2.5 mm^2/24 to 12 AWG
Stranded with Ferrules
0.2 to 2.5 mm^2 with or without plastic collar

PHYSICAL SPECIFICATIONS (CONTINUED)

Table 1. Termination Cable Types and Part Numbers

Cable Length m (ft)	Type 1 P/PVC [a]	Type 1 LSZH [b]	Type 1 H/XLPE[c]
0.5 (1.6)	P0916DA	P0928AA	P0916VA
1.0 (3.2)	P0916DB	P0928AB	P0916VB
2.0 (6.6)	P0931RM	P0928AC	P0931RR
3.0 (9.8)	P0916DC	P0928AD	P0916VC
5.0 (16.4)	P0916DD	P0928AE	P0916VD
10.0 (32.8)	P0916DE	P0928AF	P0916VE
15.0 (49.2)	P0916DF	P0928AG	P0916VF
20.0 (65.6)	P0916DG	P0928AH	P0916VG
25.0 (82.0)	P0916DH	P0928AJ	P0916VH
30.0 (98.4)	P0916DJ	P0928AK	P0916VJ

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range: -20 to +80°C (-4 to +176°F).

(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F).

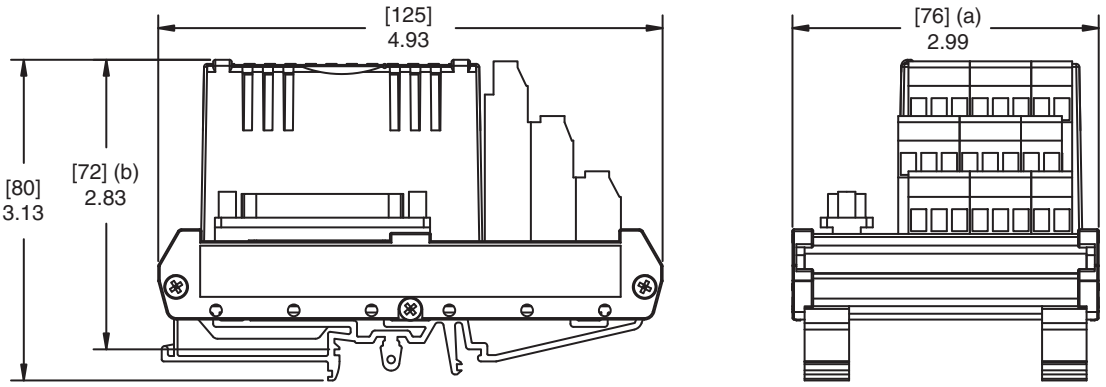
(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. Temperature range: -40 to +90°C (-40 to +194°F). Hypalon cables are no longer available for purchase.

Use of Termination Assemblies in 100 Series Upgrade Subsystem

When an FBM246b is used to replace the 100 Series FBM46, it may use any of the appropriate termination assemblies listed above for the FBM46's field I/O wiring. Alternatively, the FBM246b can accept this field wiring through a Termination Assembly Adapter (TAA) instead of a termination assembly. This is discussed in *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 31H-2W4).

DIMENSIONS–NOMINAL

[mm]
in
Termination Assemblies



(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

RELATED PRODUCT SPECIFICATION SHEETS

PSS Number	Description
PSS 31H-2S200	Standard 200 Series Subsystem Overview
PSS 31H-2W100	100 Series Fieldbus Module Upgrade Subsystem Overview
PSS 31H-2CERTS	Standard and Compact 200 Series I/O - Agency Certification
PSS 31H-2W4	Termination Assembly Adapter Modules for 100 Series Upgrade
PSS 31H-2SBASEPLT	Standard 200 Series Baseplates
PSS 31H-2W8	100 Series Conversion Mounting Structures
PSS 21S-3CP270ICS	Control Processor 270 (CP270) Integrated Control Software

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